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Using Light to Create Nanogrids in Polymer/Nanoparticles Composites[1] YA LIU, OLGA KUKSENOK, ANNA BALAZS, University of Pittsburgh — One of the challenges in creating high-performance polymeric nanocomposites is establishing effective routes for controlling the morphology of both the polymeric components and the nanoparticles, which impart the desirable optical, electrical and mechanical properties to the material. Using computational modeling, we design an effective method to control assembly of polymeric nanocomposites comprising nanorods and a photosensitive binary blend. We focus on scenarios where the composites can be organized into variety of nanogrids with well defined structural features. We harness non-uniform light illumination with the background illumination of the entire composite and secondary, higher intensity light sources that are rastered over the sample. We show that our system displays an essentially defect-free morphology, with the nanoparticles localized in the energetically favorable domains. Furthermore, we demonstrate that by controlling the length and a chemical nature of nanorods (such as their wetting properties), one can order both polymeric components and nanoparticles into variety of complex nanogrid structures. The ability to control morphology provides a means of tailoring the properties and ultimate performance of these hybrid materials.

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